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Time Utilization in Block laying Activity on construction projects in Abuja, Nigeria

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Abstract

The purpose of this study is to evaluate the effective time utilization by craftsmen in bricklaying activity on construction projects in Abuja Nigeria. This research is designed to investigate the relationship between effective time utilization and productivity in block laying activity in Abuja. A mixed research methodology was adopted using a questionnaire and direct observation on site. It was observed that there is a significant relationship between effective time utilization and productivity. There are factors affecting effective use of time resulting in loss of productivity. Hence, there should be more effective plan in work activity. The use of baseline productivity benchmark index is highly recommended.

Keywords: Time utilization, productivity, block laying activity, construction projects

1. Introduction

According to Mistry and Bhatt (2013) construction projects involve lots of activities amongst which is bricklaying. Hence, block-laying takes a major part in the building process. Surveys have shown that block work take about 45-70% of the physical structure of a building (Oyekan, 2011). Therefore, bricklaying is part of major determinant of the project time. (Charted Institute of Building, 2008) has indicated that the quality of time-management on construction projects is generally poor. Therefore, an effective time management for the construction project is important in project managing for its completion. Delivery of project on schedule is very pertinent, as project delay have tendency to in cur more cost, loss of productivity, and revenue, (Owolabi, 2014). Many well planned project schedule failed because of improper utilization of project time during implementation of major construction activities such as bricklaying (Kolo, Afuye & Demide, 2013). Improper utilization of time during major construction activities such bricklaying by craftsmen and laborers', delay in responding to the needs of contractors by clients who were not conscious of the scheduled project time have caused overrun in many projects in Nigeria (Petri 2014).

This study focuses on evaluating the time utilization in block laying activity in building construction in Abuja and intends to provide answers to the following research questions which include:

What are the factors affecting effective utilization of craftsmen in block laying?

What are the productive time and unproductive time in block laying activity in Abuja?

What is the relationship between effective time utilization and productivity in block laying activity Abuja?

2. Review of Literature

2.1 Time Utilization and Productivity

According Mohammed (2016) time Utilization is the measures percentage of time spent by laborer or employees on billable projects against the total time worked thus time Utilization is crucial to overall organizational profitability and productivity and it is examined in conjunction with overall revenue and profit per person. On the other hand According to Mistry and Bhatt (2013) Productivity measures how efficiently resources are employed, and it is defined as the ratio of a specific measure of output to a specific measure of input per unit of

labor. Labour productivity in Construction industry is critical to the success of the industry thus, important for the estimation and scheduling of construction activities (Lawal, *et al.,* 2004).

2.2 Measures to Improve Utilization and Productivity

According to Mohammed (2016) some of the key Steps to Improve Employee Utilization and Productivity include:

1. **Effective time tracking:** At a minimum, billable employee should be monitoring and recording their activities throughout the day in the same way, with a full time resolution, before leaving the site or signing off.
2. **Collect and analyze data:** The data gather from your billing activities, time sheets, and projects will help establish clear benchmarks and goals for increasing the utilization of the teams and individual employees.
3. **Manage Customer Expectations**: communicate to the entire team the importance of managing the customer's expectation from initial enquiry all the way through to project delivery.
4. **Incentivize:** Making employees feel like they are a part of the entire company's success is essential to increasing productivity, improving morale, and building team cohesion.
5. **Set reasonable goals:** Setting reasonable utilization goals provides a benchmark for individual workers and departments. It also supports better planning and distribution of corporate resources

2.3 Factors Affecting Labour Productivity

Mohammed (2016) identifies Lack of Motivation Lack of Training and Retraining Poor Communication and Overtime, as factors that affect Labour productivity. While (Lawal *et al.,* 2004) mentioned Fatigue, Concurrent Operations, Absenteeism, Morale and Attitude as factors affecting labour productivity. Similarly, Adnan, E. *et al.,* (2007) cited Material shortages, Lack of labour experience, Lack of labour surveillance, Misunderstanding between labour and superintendents, Drawings and specifications alteration during execution, and inefficiency of equipment as factors that affect Labour productivity.

3. Methodology

Mixed research methodology was used which involves the use of quantitative and qualitative techniques to obtain data. The study population consists of all block laying mason, foremen and supervisors in the entire case study firms currently undertaking on-going building project in Abuja which amounted to six (6) construction firms which are duly registered with Corporate Affairs Commission. The sample frame for this study constitutes supervisors, foremen and block layers. The sample size includes 6-supervisors, 10-foremen and 44-masons, making a total of 60 respondents for the questionnaires. The number was then reduced to 52 on applying 5% error and 95% confidence level upon the application of Morgan table. In this study, a purposive sampling technique was used. The data for this study was collected from two main sources using two research instruments which are structured questionnaire and direct site observation

4. Data Presentation Analysis and Discussion of Results

4.1 Factors Affecting Effective Time Utilization in Block Laying Activities

The respondents identified eleven (11) factors affecting time utilization in block laying activities in Abuja-Nigeria which were ranked in terms of relevance seen in Table 1.

Table 1: Factors Affecting effective Time Utilization in Block Laying in Abuja

S/No	Factors	RII	Ranks
1	Waiting for materials	0.895	1
2	Rework	0.716	2
3	Complexity of design	0.682	3
4	Lack of experience	0.670	4
5	Lack of incentives	0.661	5
6	Lack of strict supervision	0.642	6
7	Unclear information	0.613	7
8	Weather	0.576	8
9	Frequent phone calls	0.544	9

10	Frequent going to toilet	0.520	10
11	Interruption from other gang		11

Field Survey 2020

4.2 Productivity, Unproductivity and Productive Time of Block Layers

This section present results of physical observations made on construction sites on the block layers. Six construction projects in Abuja Nigeria were used as case study. The observation was done for one week (7 days) and data on productive and unproductive time was determined as presented in Table 2 to 8 for each project.

Table 2: Productive, Unproductive, output and daily productivity of block layers

Days	Gang size	Available Total Working time	Productive Time (Hr)	Unproductive Time (Hr)	Daily Quantity (m^2)	Daily Productive (whr/m^2)
1	2	14	12.35	1.65	12.8	1.094
2	2	14	11.00	3.00	13.5	1.037
3	2	14	13.00	1.00	11.00	1.273
4	2	14	12.25	1.75	14.00	1.000
5	2	14	13.35	0.65	10.60	1.321
6	2	14	9.00	5.00	12.50	1.120
7	2	14	10.25	3.75	13.00	1.077
Average			10.171	2.007	12.486	1.132

Field Survey 2020

Table 3: Productive, unproductive, output and daily productivity of block layers

Days	Gang size	Available Total Working time	Productive Time (Hr)	Unproductive Time (Hr)	Daily Quantity (m^2)	Daily Productive (whr/m^2)
1	2	14	13.00	1.00	10.00	1.400
2	2	14	12.75	1.25	8.65	1.618
3	2	14	13.45	0.55	9.76	1.434
4	2	14	11.50	3.58	11.90	1.176
5	2	14	11.45	3.55	13.00	1.077
6	2	14	12.30	1.70	9.00	1.556
7	2	14	12.00		8.32	1.682
Average			12.35	1.661	10.09	1.420

Field Survey 2020

Table 3: Productive, Unproductive, output and daily productivity of block layers

Days	Gang size	Available Total Working time	Productive Time (Hr)	Unproductive Time (Hr)	Daily Quantity (m^2)	Daily Productive (whr/m^2)
1	2	14	10.00	4	8.40	1.667
2	2	14	12.00	2	13.00	1.077
3	2	14	10.50	3.5	9.12	1.535
4	2	14	12.50	1.5	12.13	1.154
5	2	14	13.00	1.00	15.00	0.933
6	2	14	9.00	5.00	8.30	1.687
7	2	14	11.00	3.00	10.00	1.400
Average			11.143	2.857	10.85	1.350

Field Survey 2020

Table: Shows productive, unproductive, output and daily productivity of block layers.

Days	Gang size	Available Total Working time	Productive Time (Hr)	Unproductive Time (Hr)	Daily Quantity (m^2)	Daily Productive (whr/m^2)
1	2	14	13	1	13.00	1.076
2	2	14	9	5	8.90	1.573
3	2	14	10.5	3.5	11.00	1.272
4	2	14	11	3	10.21	1.371
5	2	14	12	2	12.00	1.166
6	2	14	12	2	12.50	1.12
7	2	14	13	1	14.00	1.00
Average			11.5	2.5	11.658	1.225

Field Survey 2020

Table 5: Shows productive, unproductive, output and daily productivity of block layers.

Days	Gang size	Available Total Working time	Productive Time (Hr)	Unproductive Time (Hr)	Daily Quantity (m^2)	Daily Productive (whr/m^2)
1	2	16	13.50	2.5	12.00	1.333
2	2	16	14.50	1.5	14.00	1.143
3	2	16	12.00	4.0	11.5	1.391
4	2	16	15.00	1.00	14.00	1.143
5	2	16	11.00	5.00	10.00	1.600
6	2	16	13.00	3.00	11.00	1.455
7	2	16	14.00	1.00	13.5	1.185
Average			13.286	2.57	12.286	1.321

Field Survey 2020

Table 6: Shows productive, unproductive, output and daily productivity of block layers.

Days	Gang size	Available Total Working time	Productive Time (Hr)	Unproductive Time (Hr)	Daily Quantity (m^2)	Daily Productive (whr/m^2)
1	2	16	14.00	4.00	12.50	1.280
2	2	16	9.35	6.65	9.00	1.778
3	2	16	12.80	3.20	11.00	1.454
4	2	16	13.00	3.00	12.00	1.333
5	2	16	12.00	4.00	9.50	1.684
6	2	16	14.50	1.50	13.00	1.231
7	2	16	13.500	2.50	11.00	1.454
Average			12.735	3.55	11.143	1.459

Field Survey 2020

4.3 Effective Time Utilization and Productivity in Block Laying Activity

This section present results of the analysis of predictors in order to show the relationship between time utilization and productivity in block laying activity.

Analysis of the Predictors

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
S1	.720[a]	.518	.397	.09481

a. Predictors: (Constant), effective time utilization

Table 8: Analysis of Variation (ANOVA)

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	.039	1	.039	4.296	.107[a]
Residual	.036	4	.009		
Total	.075	5			

4.3 Effective Time Utilization and Productivity in Block Laying Activity

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Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
S1	.720[a]	.518	.397	.09481

a. Predictors: (Constant), effective time utilization

From the p value in the last column, p>0.05, it can be said that the relationship does not well represent the data as the p value is greater than .05

Table 9: Standardized and Unstandardized Co-efficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
(Constant)	.406	.442		.919	.410
Effective time utilization	.077	.037	.720	2.073	.107

a. Dependent Variable: productivity in blocklaying. The resultant equation is

Productivity = 0.077(effective time utilization) + 0.406

Considering the result above, the p-value, the R square, the effective time utilization might not be a good predictor of productivity.

5. Discussion of Results

From the survey carried out, factors affecting effective time utilization in block laying activity in Abuja the result revealed that waiting for materials ranked the most important factor affecting time utilization with relative importance index of 0.895 while Interruption from other gang was the least with relative importance of 0.510.The summary of the factors shows that as the relative index of importance decreases with time so also the ranking decreases with time affecting the total time utilization of laying blocks.

Factors showing productive, unproductive, output and daily productivity of block layers in Abuja. The results from all the sampled construction sites indicated that there was loss of time (unproductive time). The cumulative average daily productivity of the block layers in Abuja was 1.32whr/m^2. This average is higher than the standard average productivity of block layers which ranges from 0.1 – 1.0. A good productivity value as a unit rate ranges from 0-1 and the value of cumulative average productivity is above 1.0. This means that the productivity of the block layers sampled were below average.

The regression analysis performed to establish the relationship between effective time utilization and productivity in block laying activity Abuja by using unproductive time against daily productivity. The lower the values of cumulative productivity the best productivity value that can be obtain in a project. It is lower than cumulative value. It was observed that lower value of PR indicated better performance.

6. Conclusion and Recommendations

The effective time utilization paradigm used provides a suitable ranking of the material factors utilized according to their individual relative importance to eventually confirm the effective utilization of time. The value ranked at the highest point according to their importance revealed the high relative importance index of the time utilized on using the material while the value ranked at the lowest point according to their importance revealed the low relative importance index of the time utilized on using the material. The cumulative productivity ascertained eventually determined the best productivity value that can be obtained in a project. The regression analysis used to determine the cumulative productivity index can be adopted for use in the determination of the effective time utilized with the used of the baseline productivity benchmark index is highly recommended. Also the use of both standardized and unstandardized model in deriving the analysis is recommended.

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